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REMARKS

Claims 1-21 are pending. Claims 1, 7, and 14 are generic, and claims 2, 8, and 15 are subgeneric. New claim 21 is added. No new matter is added by this amendment. Support for claim 21 is found at page 4 of the Specification. Applicants respectfully request reconsideration and timely withdrawal of the pending rejections for the reasons discussed below.

Drawings

Applicants appreciate the indication that the drawings filed March 2, 2002 are acceptable.

35 U.S.C. § 102 Rejection

Claims 1-3, 7-9, and 14-16 are rejected under 35 U.S.C. § 102(e) as anticipated by U. S. Patent No. 6,134,339 issued to Luo, *et al.* ("Luo"). Applicants respectfully traverse this rejection for at least the following reasons.

Claim 1 recites, in pertinent part:

... means for digitizing said output signal and capturing a first image from said first interval having an illuminator signal portion and an ambient light noise portion and capturing a second image from said second interval having said ambient light noise portion;
and

means for subtracting said first image from said second image to produce an output image substantially devoid of said ambient light noise portion ...

The Examiner suggests that Luo at col. 7 discloses these features. Applicants respectfully disagree. Luo discloses a system and apparatus for reducing red-eye effects in pictures. Luo further discloses capturing and saving a first color frame S1 of video having only

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ambient illumination. Thereafter, a direct illumination source is triggered so that light is emitted as a camera captures the next color video frame S2. Contrary to the present invention, Luo discloses compensating the captured frames to yield an overall illumination change between the two captured frames. Mathematically, this is expressed as $(S1 + S2)/2$. Thereafter, the compensated frame is subtracted from either the first frame S1 or the second frame S2, e.g., $S1 - [(S1+S2)/2]$ or $S2 - [(S1+S2)/2]$, to yield a compensated color image. This image is further scanned for any pairs of regions that have high intensity pixel values, particularly in at least one color channel (e.g., red for human eyes, green for animal eyes).

However, the features taught by Luo are not the features recited in claim 1. In particular, contrary to Luo, the subtraction of the first frame from the second frame recited in claim 1 subtracts out the full value of the ambient IR illumination, which is different than Luo's compensated value (e.g., average overall value) of combined illuminated and ambient illumination. This is illustrated by reference to page 4 of Applicants' specification, where it is noted that subtracting the first frame from the second frame yields a new image that contains only the information from the modulated illuminator signal. The resulting image can then be used by an eye tracker system to compute a direction of eye gaze even in the presence of ambient IR source.

Because Luo fails to disclose subtracting a first frame from a second frame as recited by the claimed invention, claim 1 is distinguishable over Luo. Claims 2-3 are allowable because they depend on distinguishable base claim 1, as well as for their added features.

Additionally, claim 3 is further distinguishable over Luo in that it recites, in pertinent part:

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wherein said means for subtracting subtracts according to the expression $o_n = |f_n - f_{n-1}|$, where n is an integer ≥ 0 , o is said output image, and f are said camera frames.

The Examiner suggests that Luo discloses this feature. Applicants disagree because the equation recited in claim 3 does not represent a compensated (e.g., average value) image as taught by Luo. This is evident from the fact that the recited equation does not include division of any sort, as Luo requires; and that it does not subtract a compensated value from either the first frame or the second frame, as Luo teaches. Calculating and subtracting a compensated value is essential to Luo because Luo is concerned with locating high intensity color values within a color image, which indicate the existence of a red-eye or similar defect. The present invention, on the other hand, is concerned with increasing a signal-to-noise ratio in an IR eye-gaze tracker, so as to determine eye-gaze movements even in the presence of high amounts of ambient IR illumination. To determine eye-gaze movements in the presence of high amounts of ambient IR illumination requires that the full (not average) value of the ambient IR radiation be removed from a captured image. Consequently, claim 3 is further distinguishable over Luo. Accordingly, prompt withdrawal of the rejection of claim 3 is requested.

Similar to claim 1, claim 7 (method) and claim 14 (computer readable medium) each recite, in pertinent part:

... detecting said modulated light reflected from the user's eye and simultaneously detecting noise light from an ambient source during said first interval and producing a first data comprising a reflection portion and a noise portion; ...

detecting said noise light from said ambient source during said second interval and producing a second data comprising said noise portion; and

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subtracting said second data from said first data to produce an output data comprising said reflection portion ...

As mentioned above, Luo does not teach subtracting a noise portion (second data) from a frame that includes both a reflection portion and a noise portion (first data). Instead, Luo teaches subtracting a compensated value from either a first or a second frame. Thus, for reasons similar to those referenced above with respect to claim 1, claims 7 and 14 are also distinguishable over Luo. Claims 8-9 and 15-16 are also allowable because they depend from distinguishable base claims. Accordingly, withdrawal of the rejection of claims 7-9 and 14-16 is requested.

Additionally, Claim 16 is further distinguishable over Luo because, as explained above with reference to claim 3, Luo fails to disclose the equation that claim 16 recites.

New claim 21 is allowable because it depends from distinguishable base claim 1, as well as for its own merits. Claim 21 recites, in pertinent part:

... wherein said means for subtracting said first image from said second image subtracts said first image from said second image pixel-by-pixel.

Nothing in Luo discloses this feature. In contrast, Luo discloses compensating frames for overall illumination change between frames, obtaining a compensated color image, and scanning the obtained compensated color image to determine pairs of regions having high intensity pixel value in at least one color channel. But the claimed pixel-by-pixel subtraction is very different from the image compensation taught by Luo. This is evidenced by the fact that the claimed invention yields different results than Luo. For example, Luo yields a compensated color image containing at least some ambient illumination. In contrast, the invention of claim 21 yields an

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image having only an illuminated portion, which is substantially devoid of ambient IR radiation.

For these reasons, claim 21 is distinguishable over Luo and in condition for allowance.

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CONCLUSION

In view of the foregoing remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicants hereby make a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to **IBM Deposit Account No. 50-0510** (Yorktown).

Respectfully submitted,



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